

## DESCRIPTION

A METHOD OF LABELLING AN IMAGE ON A DISPLAY

5 This invention relates to a method of labelling an image for display on a screen and to a computer program, a computer-readable storage medium and apparatus for the same. In particular, the invention relates to a method in which a rotatable image such as a map is displayed and text labels associated with parts or features of that image are displayed dynamically.

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PCT patent application, publication number WO86/02764 discloses displaying a street map with dynamic labelling of the streets wherein "each label is placed close to and parallel to its corresponding street and with an orientation closest to right side up" and wherein, as illustrated in figures 4A to 15 4G of WO86/02764, the orientation of the text of each label is flipped 180° when the label passes vertical.

US patent 6011494 discloses displaying a map in "bird's eye view" mode wherein the orientation of the map changes depending on the direction of travel of a vehicle or a user, and wherein, as illustrated in figure 27 of 20 US6011494, the orientation of labels of features of the map is uniformly horizontal.

US patent 5297051 discloses displaying a street map with dynamic labelling of the streets wherein individual characters of each label remain upright when a label is changed from horizontal to vertical orientation upon the 25 direction of display of the map being changed between North or South and East or West.

It is an object of the invention to provide an improved method of labelling parts or features of a rotatable image for display on a screen and, in 30 particular, where the image and / or labelling are especially complicated.

In accordance with a first aspect of the present invention, a method of labelling an image for display on a screen is provided comprising the steps of retrieving the image, displaying the image rotated, and displaying first and second text labels on the image wherein each label identifies a part or feature of the image, and wherein the first text label is displayed in accordance with a first labelling scheme, and the second text label is displayed in accordance with a second labelling scheme, different from the first labelling scheme

Whilst the prior art teaches displaying one or other of superimposed text labels which rotate with an image or superimposed text labels which have a fixed orientation over an image, the inventor has realised that it is desirable to have a combination of these, especially when the image and / or associated labelling are especially complicated. The inventor has appreciated that certain parts or features of an image such as a map are most clearly labelled using a particular labelling technique, and therefore a combination of such labelling techniques ensures that when an image having different parts or features labelled rotates, the labelling remains clear and easy to read.

The method may further comprise the step of displaying the image unrotated prior to displaying the image rotated wherein the first and second text labels are displayed on the unrotated image in accordance with the same respective schemes as used for the rotated image.

Also, each text label displayed on the image may be retrieved for display from a database which indicates either directly or indirectly which labelling scheme it is to be displayed in accordance with.

If the first and second text labels are members of first and second groups of text labels respectively, text labels in the same group are ideally displayed in accordance with the same labelling scheme.

One of the labelling schemes may consist of displaying text labels rotated with the image, of displaying text labels horizontal on the display (i.e. without rotation) or, in accordance with a second aspect of the present invention, displaying text labels rotated to one of a plurality of possible orientations relative to the rotated image. In the case of the latter, the angular

separation between those possible orientations may be constant and, ideally, the number of such possible orientations odd.

The present invention will now be described, by way of example only,  
5 with reference to the accompanying figures in which:

Figures 1A to 1F are images labelled with text labels using a labelling method according to a first aspect of the present invention;

Figures 2A to 2H are images labelled with text labels using an alternative labelling method according to a second aspect of the present  
10 invention;

Figures 3A to 3N, 4A to 4E and 5A to 5K are diagrams further illustrating the alternative labelling method illustrated in figures 2A to 2H; and

Figure 6 shows, schematically, a computer system capable of  
15 implementing a labelling method in accordance with the present invention.

Figures 1A to 1F are images composed of an extract from a map together with associated text labels for display on a conventional display.  
20 Specifically, the image consists of connecting roads High Street and Black Road with a feature, in this case a "Town Hall", located at their junction. Figures 1A to 1E shown the same map in five different orientations whereby from an initial orientation in figure 1A, the map of figures 1B, 1C, 1D and 1E are rotated anti-clockwise by approximately 45°, 135°, 225° and 315°  
25 respectively.

The labels of Black Road and the High Street are superimposed on the image such that they rotate with the map and such that the text of those labels are oriented as summarised in table 1 below in order to ensure that the text remains upright.

Road	Figure 1A	Figure 1B	Figure 1C	Figure 1D	Figure 1E
High Street	Normal	Normal	Flipped	Flipped	Normal
Black Road	Normal	Normal	Normal	Flipped	Flipped

**Table 1: Orientation of the text of the road labels in figures 1A to 1E**

When a text label is rotated past vertical, the orientation of the text is flipped 180° to ensure it remains upright. This may be at precisely vertical, as the label approaches vertical or just after vertical. Also, the default orientation of the text at vertical may be as illustrated by Black Road in figure 1A or, alternatively, as illustrated by the same in figure 1F.

The orientation of the label of the Town Hall remains constantly horizontal, notwithstanding the rotation of the map.

Figures 2A to 2H are the same images as shown in figures 1A to 1F with an alternative method of labelling. From an initial orientation in figure 2A, the maps of figures 2B, 2C, 2D, 2E, 2F, 2G and 2H are rotated anti-clockwise by 30°, 60°, 120°, 150°, 210°, 240°, 300° and 330° respectively.

The labels of Black Road and the High Street are superimposed on the image in the same way as described with reference to figures 1A to 1E above.

The rotation of the labels of the "Town Hall" feature, summarised in table 2 below, follows that of the image except that the text label may be further rotated 90°, 180° or 270° clockwise such that the label remains parallel to the sides of the square "Town Hall" feature which are closest to horizontal and such that the text of those labels remains upright.

Figure	2A	2B	2C	2D	2E	2F	2G	2H	2I
Image Rotation (°)	0	30	60	120	150	210	240	300	330
Label Rotation (°)	0	30	-30	30	-30	30	-30	30	-30

**Table 2: Rotation of the "Town Hall" label in figures 3A to 3I**

The underlying principle of the labelling of the square "Town Hall" feature of figures 2A to 2H can be extended to labelling of different shapes as shown in figures 3A to 3M which from an initial orientation in figure 3A, a

triangle feature is rotated anti-clockwise by 20°, 40°, 80°, 100°, 140°, 160°, 200°, 220°, 260°, 280°, 320° and 340° respectively.

The rotation of the labels of the triangle feature, summarised in table 3 below, follows that of the image except that the text label may be further rotated 60°, 120°, 180°, 240° or 300° clockwise such that the label remains parallel to the side of the triangle which is closest to horizontal and such that the text of those labels remains upright. As the text labels have 3 possible orientations with an constant angular separation between them, the maximum deviation from the horizontal is  $\pm 30^\circ$ .

Figure	3A	3B	3C	3D	3E	3F	3G
Image Rotation (°)	0	20	40	80	100	140	160
Label Rotation (°)	0	20	-20	20	-20	20	-20
Figure	3H	3I	3J	3K	3L	3M	
Image Rotation (°)	200	220	260	280	320	340	
Label Rotation (°)	20	-20	20	-20	20	-20	

Table 3: Rotation of the "Town Hall" label in figures 3A to 3M

If it is desired to label a shape with the label parallel to one or other of the lower or upper sides of the triangle, the maximum deviation from the horizontal is increased to  $\pm 60^\circ$ . This is illustrated in figure 3N where instead of the labelling shown in 3C, the alternative labelling shown in figure 3N is applied such that the label continues to be parallel to one or other of the lower sides of the triangle as is the case in figures 3A and 3B.

The labelling method used to label the square "Town Hall" feature in figures 2A to 2H and the triangular feature in figures 3A to 3M is not limit to labelling polygons but rather can be used at any time when a label can be displayed rotated at any number of possible orientations relative to a rotated image.

For example, see figures 4A to 4E and figures 5A to 5K in which, for four and five possible orientations respectively, a reference line (indicated by

dots at either end of the line) is rotated anti-clockwise 180° and labelled such that the label has one of four or five possible orientations relative to the rotated reference line, and such that the label is oriented to be as close as possible to the horizontal.

5        It is noteworthy that because of symmetry where there is a even number of possible orientations with a constant angular separation between them, the maximum deviation of the orientations of the labels from the horizontal is greater than would be the case if that number were reduced, by up to a half, to an odd number of possible orientations. When there are three,  
10    four and five possible, equally spaced orientation, the maximum deviation of the orientations of the labels from the horizontal is  $\pm 30^\circ$ ,  $\pm 45^\circ$  and  $\pm 18^\circ$  respectively.

Dynamic labelling whereby an map image and the associated labels are stored independently and the map selective labelled depending on a user's  
15    requirement is known from at least US6011494. To facilitate such selective labelling and to utilise the present invention, it is desirable for each text label to be retrieved for display from a database which identifies which manner of labelling is to be used. That is, whether the label is to be displayed rotated with the image or not. Where first and second groups of text labels are displayed, it  
20    may be convenient for each text label to be retrieved for display from a database which identifies which group that text label belongs to, thereby indicating whether it is to be displayed rotated with the image or not.

A conventional computer system capable of implementing the above method is shown schematically in figure 4 comprising a display, a CPU tower  
25    with a floppy disc drive and a keyboard, all coupled to the processor in known manner. Implementation of a method according to the present invention in such a computer system may be readily accomplished in hardware, in a computer program (either in situ on a computer or stored on storage media) by appropriate computer programming and configuration or through a  
30    combination of both. Of course, such programming and configuration is well known and would be accomplished by one of ordinary skill in the art without undue burden.

It would be further understood by one of ordinary skill in the art that the teaching of the present invention applies equally to other types of apparatus having a display and not only to the aforementioned computer system. For example, the invention may be employed on a mobile terminal such as a PDA  
5 or vehicle navigation system which displays a rotated map depending on the orientation of the device, and / or the heading of the user or host vehicle.